What is claimed is:

1. A wavefront sensor for characterizing phase distortions in incident light, the wavefront sensor comprising:

optical elements that spatially sample the incident light and form a dispersed spot with a fringe pattern corresponding to samples of the incident light;

an imaging device that captures an image of the dispersed spot with said fringe pattern formed by said optical elements;

an image processor that that analyzes the spectral components of the fringe pattern of a given dispersed spot to derive a measure of the local phase distortion without ambiguity in the corresponding sample of incident light.

2. The wavefront sensor of claim 1, wherein the image processor analyzes the spatial frequency of the spectral components of the fringe pattern of a given dispersed spot to derive a measure of the local phase distortion without ambiguity in the corresponding sample of incident light.

3. The wavefront sensor of the claim 1, wherein the image processor examines slices in the captured image that correspond to a predetermined dispersion direction to thereby to derive a measure of the local phase distortion without ambiguity in a sample of incident light.

4. The wavefront sensor of claim 1, wherein the predetermined direction corresponds to a potential phase step in the incident light.

5. The wavefront sensor of claim 4, wherein the predetermined direction is parallel to a potential phase step in the incident light.

6. The wavefront sensor of claim 1, wherein the predetermined direction corresponds to a boundary between adjacent mirror segments in a deformable mirror that shapes the incident light.

7. The wavefront sensor of claim 6, wherein the predetermined direction is parallel to said boundary.

8. The wavefront sensor of claim 1, wherein said optical elements comprise a transmission grating and lens array.

9. The wavefront sensor of claim 1, wherein said optical elements comprise a refractive element.

10. The wavefront sensor of claim 1, wherein said optical elements comprises a diffractive element.

11. The wavefront sensor of claim 1, wherein said optical elements comprises a diffractive element and a refractive element.

12. The wavefront sensor of claim 1, wherein said optical elements comprises a grism.

13. The wavefront sensor of claim 1, wherein said optical elements comprise an array of grisms.

14. The wavefront sensor of claim 13, wherein said array of grisms have varying dispersion directions.

15. The wavefront sensor of claim 1, wherein said optical elements comprise an array of prism elements.

16. The wavefront sensor of claim 1, wherein said optical elements comprises a grating.

17. The wavefront sensor of claim 1, wherein said optical elements comprise a hologram.

18. The wavefront sensor of claim 3, wherein said slices are parallel to said predetermined dispersion direction.

19. The wavefront sensor of claim 3, wherein said slices are perpendicular to said predetermined dispersion direction.

20. An adaptive optic subsystem, including the wavefront sensor of any of claims 1 to 19, and a multi-segmented deformable mirror.

21. The adaptive optic system of claim 20, wherein the measurements of the wavefront sensor are used to measure phase steps at the boundary between mirror segments and correct such mirror segments.

23. A large aperture space telescope, including the adaptive optic subsystem of any of claims 20 and 21.

24. The telescope of claim 23, wherein the wavefront sensor is used to perform course adjustment of the telescope to correct for initial large phase steps.

25. A dispersed Hartmann sensor, comprising:

a Hartmann lenslet in combination with a dispersive element, whereby a Hartman spot formed by light passing through said Hartmann lenslet is dispersed at an angle to a phase step of said light.

26. A sensor according to claim 25, wherein said angle is zero so that said light passing through said Hartmann lenslet is dispersed parallel to said phase step of said light.

27. A sensor according to claim 25, wherein said dispersive element is a refractive element.

28. A sensor according to claim 25, wherein said dispersive element is a diffractive element.

29. A sensor according to claim 25, wherein said dispersive element is a combination of a diffractive element and a refractive element.

30. A sensor according to claim 29, wherein said dispersive element is a grism.

31. A sensor according to claim 29, wherein said dispersive element is a holographic grating.

32. A mirror array, comprising:

a first layer having a plurality of mirror segments, each mirror segment consisting of a center portion and a surrounding non-center portion;

a second layer having a plurality of Hartmann subapertures and a plurality of dispersed Hartmann subapertures;

said Hartmann subapertures being arranged over said center portions of said plurality of mirror segments; and

said dispersed Hartmann subapertures being arranged over those edges where said plurality of mirror segments join one another.

33. A method for measuring the size of a discontinuity in a wavefront of light, comprising the steps of:

forming a single image of said wavefront;

dispersing said image in wavelength using a combination of a Hartman lenslet and a dispersive element; and

analyzing said dispersed image along a dispersion direction of said dispersed image to measure the size of said discontinuity.

34. A system for measuring the size of a discontinuity in a wavefront of light, comprising:

means for forming a single image of said wavefront;

means for dispersing said image in wavelength using a combination of a Hartman lenslet and a dispersive element; and

means for analyzing said dispersed image along a dispersion direction of said dispersed image to measure the size of said discontinuity.

35. An optical system having a set of mirrors for focusing and directing incident light from a point source above the atmosphere, said optical system comprising:

an adaptive optics subsystem including

an imaging camera;

a tilt mirror and a deformable mirror disposed between said set of mirrors and said imaging camera;

a wavefront sensor for measuring the phase distortion in the wavefront of said incident light using a wavefront sensing method which is substantially free of 2π phase ambiguity;

a beam splitter for directing a portion of said incoming light to said tilt and deformable mirrors and said wavefront sensor; and

a first mirror driver for controlling said tilt mirror to stabilize the image;

a second mirror driver for control said deformable mirror so as to compensate for and correct phase distortions measured therein, substantially free of the 2π phase resolution ambiguity; and

a computer cooperating with said first and second drivers and said wavefront sensor and controlling components within said optical system.

36. The optical system of claim 35, wherein said optical system is a space telescope.

37. The optical system of claim 35, wherein said wavefront sensor further comprises an image processor for analyzing the spectral components of the fringe pattern of a given dispersed spot produced by said wavefront sensor, so as to derive a measure of the local phase distortion without ambiguity in the corresponding sample of incident light.

38. The optical system of claim 37, wherein said image processor analyzes the spatial frequency of the spectral components of the fringe pattern of a given dispersed spot to derive a measure of the local phase distortion without phase ambiguity in the corresponding sample of incident light.